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ABSTRACT

Reported is a study into the teaching behaviors of elementary science teachers based on the philosophy of Science Curriculum Improvement Study (SCIS). One hundred eighty-four teachers were selected from a large geographical area, having widely differing backgrounds and varying education and/or experience with SCIS programs. The Predicted Role Measure (PRM), consisting of a color, motion picture sound film, was used, and teachers were asked to indicate on a response pamphlet their degree of agreement with six possible and common teaching behaviors - all independent of one another. The participants included teachers with no SCIS experience, teachers with no SCIS experience but beginning SCIS cooperative college school science training programs, and teachers completing such programs. The longitudinal study allowed the study of 45 teachers who had taught the SCIS program with training and without for one or two years. General results showed: (1) selection for a training program was not associated with a particular score on the PRM; (2) significant differences were found with post-instructed members when compared with pre-instructed members; (3) no significant differences were found in PRM scores between post-instruction teachers and those who had at least one year teaching experience with SCIS; and (4) significant differences were noted in comparing teachers who had activity-centered classrooms with those of book-centered classrooms. (EB)

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CHANGE IN PREDICTED TEACHER BEHAVIOR BASED ON EXPERIENCE WITH AN ACTIVITY ORIENTED ELEMENTARY SCIENCE COURSE

by

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CHANGE IN PREDICTED TEACHER BEHAVIOR BASED ON EXPERIENCE WITH AN ACTIVITY ORIENTED ELEMENTARY SCIENCE COURSE

Millions of dollars have been spent on radical curriculum change in elementary school science. The emphasis of students involved with equipment and activities rather than reading and summarizing from textbooks has appeared in all of the National Science Foundation sponsored elementary science curricula. These programs, however, may require drastically different classroom behaviors by teachers. Differences in behaviors of teachers involved in the trial teaching of the Science Curriculum Improvement Study (SCIS) materials was noted and initiated the following questions:

1) Could teaching behaviors consistent with the SCIS program be identified?
2) Could teachers having behaviors consistent with the SCIS program be identified?
3) Could teachers change their teaching behaviors with education and experience?

These questions prompted a four year longitudinal study into teaching behaviors that had the following characteristics:

1) Large geographical spread in sampling;
2) Sample selection from widely differing backgrounds; and
3) Varying education and/or experience with the SCIS program.

Direct sampling of teacher behavior was contemplated but rejected due to reasons sited by Medley and Metzel, Grumbaum, and Borg.[1] In addition to the reasons given by these researchers, the following were also considered: training of observers; the large number of observers needed to observe teachers at their geographical locations several

times; and the fact that specific teaching behaviors to match the SCIS teaching strategies were needed. This would have meant that the observers would have to observe many classrooms with no guarantee that the teachers would be following one particular strategy at one given teaching time. Therefore, a secondary data gathering technique which measured teachers predictions of their teaching behaviors was used. Common secondary devices were rejected because most tended to emphasize either verbal responses or reflected general personality traits or attitudes. Predictions of actual teacher behavior were needed. Thus, a device known as The Predicted Role Measure (PRM) was developed. While the PRM was developed specifically for elementary science teaching, it could be easily adapted to any age or discipline. The Predicted Role Measure consisted of a color, motion picture sound film which shows teachers teaching elementary school children in a variety of science experiences. It was adapted from the prize winning film, "Don't Tell Me, I'll Find Out." The film was stopped nine times during the showing and teachers were asked to indicate on a response pamphlet their degree of agreement with six possible and common teaching behaviors. All six behaviors were independent of one another, and were rated on a Likert Scale of 0 through 4. The nine scenes prior to the stops reflected behaviors of asking questions, reacting to student responses, responding to questions, designing experiments, handling student disagreements, distributing materials, handling organisms and introducing concepts.

The film was chosen because it would give teachers a common, realistic situation so that their predictions would not be based on any general abstraction. The scenes were chosen because they reflected major parts of the SCIS teaching process. The statements of behavior that teachers agreed or disagreed with were selected from the literature

and previous studies in SCIS classrooms.[2] They included in every situation two statements which reflected teacher oriented behaviors in which the teacher was the dominant decision maker in the classroom; two statements in each situation which reflected student/teacher cooperation behaviors; and two statements in each situation which reflected student oriented behaviors in which students made the decision about what would happen next within the classroom.

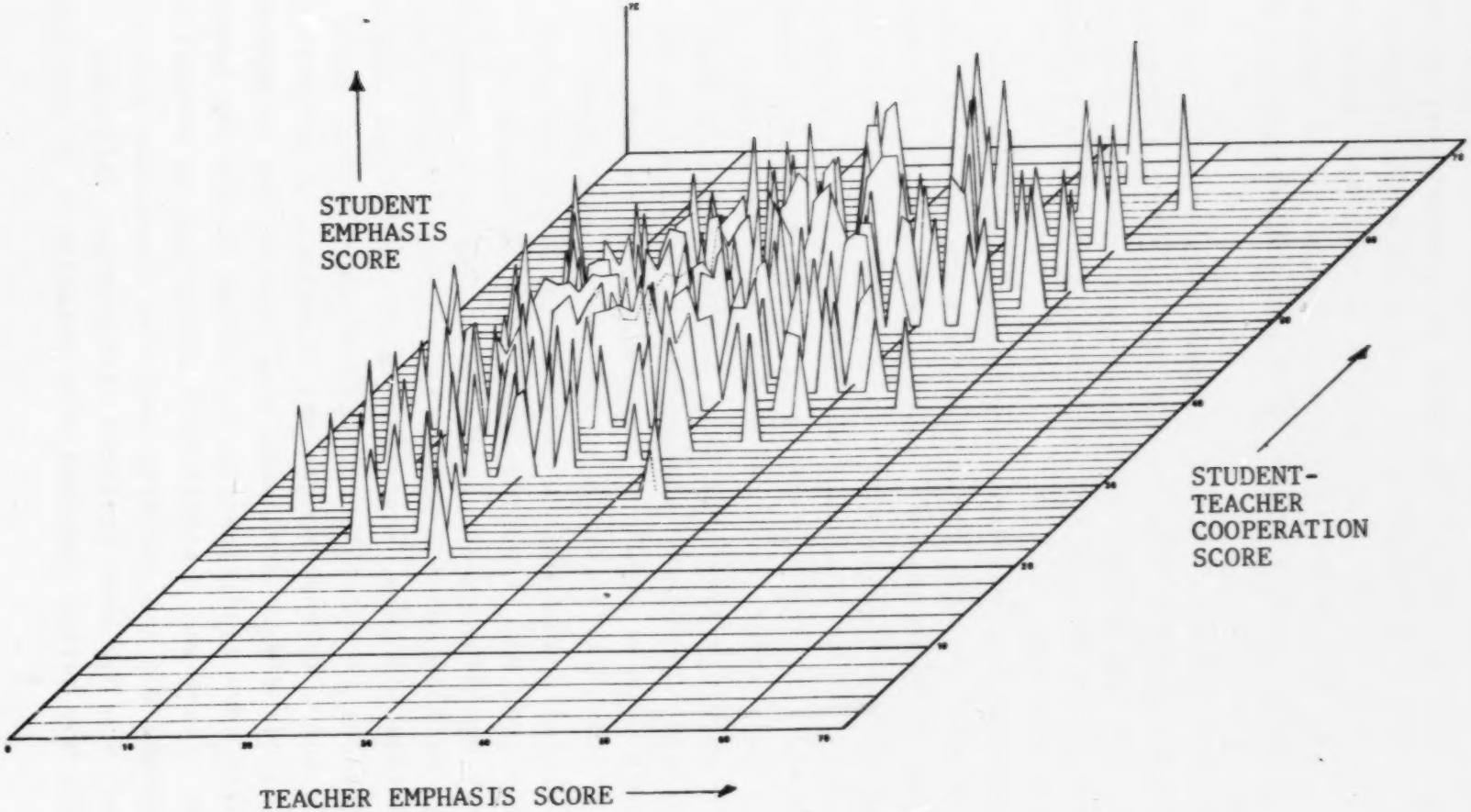
Scores generated by the degree of agreement for each of the three sets of statements were totaled. Thus, it was possible to differentiate teachers on the basis of their predicted scores. To make certain that the scores did reflect in each scene the teacher, student/teacher, or student oriented behaviors, the statements were given to a panel of SCIS staff members who acted as judges and rated the behaviors from teacher oriented through student/teacher cooperation through student oriented. The statements were modified when necessary until the agreement of the judges was 0.90 or better using the Kendall Coefficient of Concordance. The 0.90 level was selected to develop a high degree of statement accuracy even though a concordance of 0.33 would have given significant alpha equal to 0.001.[3] Once the film, with edited stops, and the pamphlet of statements was developed, initial testing was done. Using 34 teachers, it was found that the PRM had a split halves reliability of 0.84 and a comparison of predicted behaviors with actual behaviors observed in the classroom which yielded a validity of 0.74. In other words, three-fourths of the behavior that teachers predicted they would do in the classroom was actually noted in observations occuring twice a week for nine months. Thirteen teachers were involved in such observations.

Initially the PRM was administered to 184 participants in varying geographical locations. Groups consisted of 51 teachers with no SCIS experience, 69 teachers with no SCIS experience but were beginning SCIS cooperative college school science training programs, and 76 teachers completing such a training program. In addition, the longitudinal study allowed the study of 45 teachers who had taught the SCIS program with training and without training for one and for two years.

General results yielded the following information:

1) Teachers predicted they would agree with far fewer teacher oriented behaviors in the classroom than with student/teacher cooperation and student oriented behaviors. Of the 184 teachers involved, the means and standard deviations were:
   Teacher oriented $\bar{x} = 26.78$ S.D. = 10.18
   Student/teacher cooperation $\bar{x} = 47.26$ S.D. = 8.70
   Student oriented $\bar{x} = 50.35$ S.D. = 8.82;
2) Scene analysis indicated that teachers responded independently to statements using the context of the situation;[4]
3) A three-dimensional scattergram of the scores indicated the possibility of a strong correlation between the three sub-measures;
4) Bartlett's test for independence was used to test for the independence of variables and confirmed the following correlation findings indicating that the variables were not independent.[5]

Correlation of Teacher score with Student/teacher score was	0.441
Correlation of Teacher score with Student scores was	0.051
Correlation of student/teacher scores with student scores was	0.316



THREE DIMENSIONAL SCATTER DIAGRAM OF
PREDICTED ROLE MEASURE SCORES

> Thus, the multivariate analysis of variance was used to test differences in groups using the PRM. Multivariate analysis indicated a significant difference. Simultaneous T^2 contrasts were used to find which scores contributed to the significance. An alpha of 0.01 was used throughout the study.[6]

Comparison of 69 pre-institute teachers with 51 no-institute teachers found no significant score differences between the two groups and it was concluded that selection for a training program was not associated with a particular score on the PRM.

Seventy-six post-institute members were compared with 69 pre-institute members and a significant difference was found between the two groups as measured by the PRM. Simultaneous contrast intervals indicated that the differences were due to the teacher oriented decision scores and showed that the post-institute teachers scored from 4 to 13 points less than those starting such training.

Seventy-six post-institute teachers were compared with 45 post-institute teachers who in addition had at least one year of teaching experience with the SCIS program. No significant differences in the scores were found.

Several independent background variables examined included age, sex, teaching experience, enjoyment of teaching science, grade level taught, number of years of college science and the number of science method courses. In addition to these, the variable of whether the teacher was teaching an activity oriented science course versus a book oriented science course was examined. A multivariate regression analysis indicated that none of the background variables were significantly correlated to the PRM scores. However, there was a significant difference in comparing 47 teachers who had activity centered classrooms with 73 teachers who had book centered classrooms. (All were teachers not having received SCIS training.) It was found

that the teachers in activity centered classrooms were less teacher oriented than those who taught book centered classroom science as indicated by scores of 2 to 11 points less.

It is interesting to note that if the common univariate analysis of variance had been used, all three scores would have indicated a difference among pre and post-institute teachers, and activity versus book centered teachers. While differences in teaching groups could be traced to the teacher oriented behavior scores, further statistical analysis revealed that with education and experience all three teacher scores move more and more toward those scores obtained by SCIS staff members.

The long-term significance of the study indicates the following:

1) It is possible to develop a secondary device which is consistant with a new curricular program and to use this device to measure teachers' predicted behavior. Such a device can have a high degree of validity with actual teaching behaviors.
2) Teachers do change their predicted behaviors in the classroom based upon their education and experience.
3) Using the curriculum materials, teachers predicted behaviors move toward those behaviors expected by curriculum developers of SCIS.
4) While it is beneficial to involve teachers whose teaching reflect the same kind of behavior as the curriculum designers, nevertheless, teachers using quite different styles of teaching can be educated to use the new activity centered science education programs.

Work is now progressing using principle component analysis to find if the three theoretical scores can be identified from teacher responses. Also item analysis studies are being developed to improve the discrimination of all three subscores of the PRM.

References

(1) Borg, W. 1963. Educational Research: An Introduction. New York: McKay.

(1) Grumbaum, A. 1953. "Causality and the Science of Human Behavior." Readings in the Philosophy of Science. Edited by H. Feifl and M. Brodbeck. New York: Appleton-Century-Crofts, Inc.

(1) Medley, D. and Metzel, H. 1963. "Measuring Classroom Behavior by Systematic Observation." Handbook of Research on Teaching. Edited by N. L. Gage. Chicago: Rand McNally and Co.

(2) Hann, N. 1968. An Exploratory Investigation of the Effects of an Initial Experience with SCIS's Material Objects Unit on First Grade Children and Their Teachers. Far West Regional Laboratory for Educational Research and Development. Berkeley.

(2) Science Curriculum Improvement Study. 1970. Organisms, Teachers Guide. Chicago: Rand McNally and Co.

(3,4) Siegel, S. 1956. Nonparametric Statistics for the Behavioral Sciences. New York: McGraw Hill.

(5,6) Morrison, D. 1967. Multivariate Statistical Methods. New York: McGraw Hill.